

STATEMENT OF WORK FOR 76 UMBILICAL CABLE ASSEMBLIES

OVERVIEW

The vendor shall provide a total of 76 launcher umbilical cable assemblies for laboratory use in the interfacing of tactical launcher hardware to four systems of simulated Tomahawk missiles. 22 of these cable assemblies shall be for connection to a laboratory implementation of a submarine torpedo tube launcher (TTL). The remaining 54 of these assemblies shall be for connection to a laboratory implementation of a submarine capsule launcher system (CLS). A single connector type with backshell and strain-relief shall be used at the "missile simulation" end of each of the 76 cable assemblies. Furthermore, a single custom cable type and length shall be used for all of the cable assemblies. 18 of the cables shall only have a connector at the "missile simulation" end as the other end of these cables will attach to a launcher variant that is still undefined.

The vendor shall be required to obtain all of the required materials (connectors, connector contacts, connector backshells, connector strain-reliefs, and the actual custom cable) and to provide the labor to complete these assemblies. The vendor shall also deliver a single 120 foot length of the custom cable for use in making future replacement cables.

Deliveries

Upon completion of assembly of the first article of each cable type (one CLS Type 1 and one TTL Type 1), the vendor shall deliver that item to the technical POC for examination and testing. Corrections and re-inspection shall be made if necessary. Upon satisfactory completion of the first articles, the vendor shall proceed with assembly of additional copies to be delivered as follows:

Delivery Date	CLS Cables Type 1	CLS Cables Type 2	TTL Cables Type 1	TTL Cables Type 2
First articles	1		1	
3 April 2005	12		4	
9 May 2005	28		12	
1 June 2005		13		5

The vendor may accelerate this schedule if he chooses to do so.

CLS Umbilical Cables

The 54 CLS Cables shall be divided into 2 sub-groups. 41 of the CLS cables shall be referred to as CLS Cable Type 1. The other 13 of the cables shall be referred to as CLS Cable Type 2.

Each of the 54 CLS Umbilical Cable Assemblies shall be 29 to 30 feet in length. One end of each cable assembly shall use a 128-contact size-26 military connector with female crimp contacts, a backshell tube, and a strain-relief.

Connector with female contacts P/N D38999/26FJ35SN

Backshell with Strain-relief P/N 360HS001M2516M8

For the 41 CLS Cable Type 1 cables, the other end of each cable assembly shall use an 85-contact size-40 military connector with male crimp contacts, a backshell tube, and a strain-relief.

Connector P/N MS3406D40-56P
Backshell & Strain-relief P/N MS3437B-79A
(Or Full Assembly P/N MS3406DJ-40A56)

A cable assembly chart is provided with this document to define the connection details at each cable end including the specific conductors, color coded wire pairs, and drain wire assignments.

For the 13 CLS Cable Type 2 cables, the other end of each cable assembly shall not be connectorized. The appropriate connector and pinout are still undefined.

TTL Umbilical Cables

The 22 TTL Cables shall be divided into 2 sub-groups. 17 of the TTL cables shall be referred to as TTL Cable Type 1. The other 5 of the cables shall be referred to as TTL Cable Type 2.

Each of the 22 TTL Type 1 Cable Assemblies shall be 29 to 30 feet in length. One end of each cable assembly shall use a 128-contact size 26 military connector with female crimp contacts, a backshell tube, and a strain-relief. These are these same connectors used with the CLS cables.

Connector with female contacts P/N D38999/26FJ35SN
Backshell with Strain-relief P/N 360HS001M2516M8

For the 17 TTL Type 1 cables the other end of each cable assembly shall use a 56-contact military-like connector with male solder contacts and a "hammer head" backshell. These connectors with backshells of black thermo plastic (combined P/N CP3736) are available from:

SEA CON / PHOENIX, INC.
52 Airport Road
P.O. Box 2236
Westerly, RI 02891-1854
401-596-6658

The backshell is Navy drawing No. 53711-689-4552. The material is M-24519-GLT-20F-black.

The contact arrangement insert disk with male contacts is Navy Drawing 53711-689-4545. The material is MIL-M-14/8 Type GEI-5.

Strain relief is achieved by potting the finished connector wiring.

A cable assembly chart is provided with this document to define the connection details at each TTL cable end including the specific conductors, color coded wire pairs, and drain wire assignments.

For the 5 TTL Type 2 cables, the other end of each cable assembly shall not be connectorized. The appropriate connector and pinout are still undefined.

CABLE PURCHASE REQUIREMENT

All of the umbilical cable assemblies shall use the same custom cable. To be consistent with existing cable documentation this cable shall adhere to the detailed specification provided below. In addition to the cable length needed for the required cable assemblies, the vendor shall provide 120 continuous feet of unconnectorized cable for possible future use in making replacement cables of varied lengths.

CABLE DESCRIPTION

Custom copper electrical cable totaling 2400 feet with the following salient features:

Outer cable jacket of gray PVC. There is no plenum low smoke requirement (above floor use only - not to be used under a raised floor)

All insulated conductors shall be color coded with solid colors and stripes.

The overall nominal cable OD shall be less than 0.90 inch.

A center strain-relieving member (cord) is required.

There are no specific impedance requirements.

All signal conductors shall have PCV insulation rated for at least 300 Volts.

All shields shall be insulated with a non-conductive wrap from all other shields.

All shielded pairs shall also have 22AWG drain wires inside their foil shielding.

An overall aluminum foil shield shall be provided with 22 AWG drain wire.

All conductors (signals & drains) shall be 22 AWG stranded tinned copper. All conductors shall have at least 7 strands. Additional stranding is preferred.

One (1) subcable at the cable center consisting of a foil shielded twisted quad with drain wire.

Color code shall be: Red, White, Black, Green

Sixteen (16) subcables (preferably located around the cable's perimeter) each consisting of a foil shielded twisted pair with drain wire.

Color code for these pairs shall be as specified in the table below:

	1 st WIRE	2 nd WIRE
PAIR NO.	BASE COLOR	BASE COLOR
1	Black	Red
2	Black	White
3	Black	Green
4	Black	Blue
5	Black	Brown
6	Black	Yellow
7	Black	Orange
8	Red	Green
9	Red	White
10	Red	Blue
11	Red	Yellow
12	Red	Brown
13	Red	Orange
14	Green	White
15	Green	Blue
16	Green	Brown

Sixteen (16) unshielded twisted pairs. Color code shall be as specified in the table below.

	1 st WIRE			2 nd WIRE		
PAIR NO.	BASE COLOR	1 st TRACER	2 nd TRACER	BASE COLOR	1 st TRACER	2 nd TRACER
1	Orange			Blue		
2	White	Black		Red	Black	
3	Green	Black		Orange	Black	
4	Blue	Black		Black	White	
5	Red	White		Green	White	
6	Blue	White		Black	Red	
7	White	Red		Orange	Red	
8	Blue	Red		Red	Green	
9	Orange	Green		Black	White	Red
10	White	Black	Red	Red	Black	White
11	Green	Black	White	Orange	Black	White
12	Blue	Black	White	Black	Red	Green
13	White	Red	Green	Red	Black	Green
14	Green	Black	Orange	Orange	Black	Green
15	Blue	White	Orange	Black	White	Orange
16	White	Red	Orange	Orange	White	Blue

Within the backshells of all connectors, unused conductors shall have their ends insulated and terminated in such a way as to allow for their future use as spares.

See the following pages for the Cable Wiring Lists:

US TTL UMBILICAL CABLE WIRING LIST

Wire Designations:

Quad = shielded twisted set of 4 wires

A drain wire is provided for the shield

Pair = shielded twisted pair

Each pair has a drain wire for the shield

Single = single wires of unshielded twisted pairs

Cable contains:

THIS IS THE CABLE ALSO USED FOR CLS

1 foil shielded quad with drain

16 foil shielded pairs with drains

8 of these 16 pairs & their drains are unused

16 pairs (not shielded)

6 of these 32 wires are unused

1 overall cable foil shield with drain

56-PIN MIL Male SOLDER	128 PIN MIL Female CRIMP	Single, Pair, or Quad		Base Color	1st Tracer	2nd Tracer	Signal Name
AA	-	Overall Drain					Shield
AA	87	Drain	1				Shield
C	73	Drain	2				Warhead Shield
AA	39	Drain	3				Shield
AA	16	Drain	4				Shield
A	36	Drain	5				Data Shield Carry Through
AA	18	Drain	6				Shield
AA	111	Drain	7				PCM Shield Carry Through
AA	67	Drain	10				Shield
AA	97	Drain	11				Shield Carry Through
AA	101	Drain	12				Shield
AA	2	Drain	13				Shield
AA	-	Drain	14				Shield
p	50	Pair	2	Black			Data Uplink True
y	61	Pair	2	White			Data Uplink Complement
r	26	Pair	3	Black			Data Downlink True
z	27	Pair	3	Green			Data Downlink Complement
n	17	Pair	4	Blue			Data Clock Complement
x	1	Pair	4	Black			Data Clock True
h	15	Pair	5	Brown			Data Enable True
s	25	Pair	5	Black			Data Enable Complement
P	40	Pair	6	Black			Spare/Growth
T	28	Pair	6	Yellow			Spare/Growth
v	62	Pair	7	Black			Spare (+) PCM Data
Z	51	Pair	7	Orange			Spare (-) PCM Data
F	103	Pair	13	Orange			Differential Press A
L	93	Pair	13	Red			Differential Press B
j	112	Pair	14	White			Spare
AF	107	Pair	14	Green			Spare
d	76	Quad		Green			Operate Power Neutral
e	65	Quad		Red			Operate Power ph C 400 Hz
f	64	Quad		Black			Operate Power ph A 400 Hz
g	53	Quad		White			Operate Power ph B 400 Hz
AA	75	Quad Drain					Power Shield Carry Through
t	9	Single	1	Orange			DC Monitor/Reset Power
R	55	Single	2	Blue			DC Monitor/Reset Power Return
k	105	Single	3	White	Black		Booster Arm Command
K	24	Single	4	Red	Black		Missile Enabled
u	35	Single	5	Green	Black		Booster Safe Monitor
E	106	Single	6	Orange	Black		Fire Command (Intent to Launch)
N	96	Single	7	Blue	Black		Booster Safe Command
H	47	Single	8	Black	White		Booster Armed Monitor

B	85	Single	10	Green	White		CMGS Reprogram Command
Y	113	Single	11	Blue	White		Digital I/O Power Supply Return
M	23	Single	12	Black	Red		Missile Bus Monitor
a	43	Single	13	White	Red		Spare
W	104	Single	14	Orange	Red		Leak Test Sense
D	22	Single	18	Black	White	Red	Warhead Pre-Armed Monitor
AC	63	Single	20	Red	Black	White	Spare/Growth
U	79	Single	21	Green	Black	White	Identification Power
c	34	Single	22	Orange	Black	White	Weapon Ident Bit No. 0
l	33	Single	23	Blue	Black	White	Weapon Ident Bit No. 1
V	44	Single	24	Black	Red	Green	Weapon Ident Bit No. 2
AK	56	Single	25	White	Red	Green	Weapon Ident Bit No. 3
G	68	Single	26	Red	Black	Green	Weapon Ident Bit No. 4
AH	90	Single	27	Green	Black	Orange	Weapon Ident Bit No. 5
AB	102	Single	28	Orange	Black	Green	Simulator Present (AUR Simulator)
AE	108	Single	29	Blue	White	Orange	Warhead Safed Ctrl/Command
AD	7	Single	30	Black	White	Orange	Warhead Safed Monitor
AG	114	Single	32	Orange	White	Blue	Leak Test Return
b							Unused
m							Unused
w							Unused
AJ							Unused
J							Unused
S							Unused
X							Unused
	95 to 128						Jumper wire in 128-pin connector - used to select TTL type

CLS UMBILICAL CABLE WIRING LIST

Wire Designations:

Quad = shielded twisted set of 4 wires

A drain wire is provided for the shield

Pair = shielded twisted pair

Each pair has a drain wire for the shield

Single = single wires of unshielded twisted pairs

Cable contains:

1 foil shielded quad with drain

16 foil shielded pairs with drains

4 of these pairs & their drains are unused

16 pairs (not shielded)

only 1 of these 32 wires is not used

1 overall cable foil shield with drain

85-PIN MIL	128_PIN MIL	Single, Pair	BaseColor	1st Tracer	2nd Tracer	Signal Name
Male	Female	or Quad				
A	87	Drain 1				Shield
V	73	Drain 2				Shield
f	39	Drain 3				Shield
AB	16	Drain 4				Shield
AY	36	Drain 5				Data Shield Carry Through
BR	18	Drain 6				Shield
BM	111	Drain 7				PCM Shield Carry Through
BJ	87	Drain 8				Shield
AP	87	Drain 9				Shield
t	67	Drain 10				Shield
Y	97	Drain 11				Shield Carry Through
P	101	Drain 12				Shield
AT	87	Drain Overall				Chassis Static Ground
C		Pair 1	Black			Not Used
B		Pair 1	Red			Not Used
M	50	Pair 2	Black			Data Uplink True
L	61	Pair 2	White			Data Uplink Complement
W	26	Pair 3	Black			Data Downlink True
g	27	Pair 3	Green			Data Downlink Complement
s	1	Pair 4	Black			Data Clock True
r	17	Pair 4	Blue			Data Clock Complement
AN	15	Pair 5	Brown			Data Enable True
AM	25	Pair 5	Black			Data Enable Complement
BF	28	Pair 6	Yellow			Spare/Growth
BH	40	Pair 6	Black			Spare/Growth
BT	51	Pair 7	Orange			Spare (-) PCM Data
BU	62	Pair 7	Black			Spare (+) PCM Data
BA		Pair 8	Red			Not Used
AZ		Pair 8	Green			Not Used
AC	2	Pair 9	White			Capsule Power Return
AD	123	Pair 9	Red			Capsule F.U. Regulator Power
i	78	Pair 10	Red			Coded Launch Signal
h	89	Pair 10	Blue			Coded Launch Signal Excitation
X	74	Pair 11	Yellow			Coded Charge Signal Excitation
N	86	Pair 11	Red			Coded Charge Signal
F	120	Pair 12	Red			Capsule F.U. Converter Power
E	127	Pair 12	Brown			Capsule Monitor Power
m	53	Quad	White			Operate Power ph B 400 Hz
n	64	Quad	Black			Operate Power ph A 400 Hz
x	65	Quad	Red			Operate Power ph C 400 Hz
w	76	Quad	Green			Operate Power Neutral
y	75	Quad Drain				Power Shield Carry Through
b	9	Single 1	Orange			DC Monitor/Reset Power
c	55	Single 2	Blue			DC Monitor/Reset Power Return
p	105	Single 3	White	Black		Booster Arm Command
z	24	Single 4	Red	Black		Missile Enabled

AK	35	Single	-	Green	Black		Booster Safe Monitor
AV	106	Single	6	Orange	Black		Fire Command (Intent to Launch)
AJ	96	Single	7	Blue	Black		Booster Safe Command
AU	47	Single	8	Black	White		Booster Armed Monitor
u	122	Single	9	Red	White		Capsule Arm Command
BB	85	Single	10	Green	White		CMGS Reprogram Command
v	113	Single	11	Blue	White		Digital I/O Power Supply Return
AF	23	Single	12	Black	Red		Missile Bus Monitor
H	43	Single	13	White	Red		Spare
J	104	Single	14	Orange	Red		Spare
j	32	Single	15	Blue	Red		Capsule Armed Monitor
Z	21	Single	16	Red	Green		Capsule Safed Monitor
R	13	Single	17	Orange	Green		Fire Pulse Detected
S	22	Single	18	Black	White	Red	Liquid In Capsule
D	6	Single	19	White	Black	Red	Missile Away
k	63	Single	20	Red	Black	White	Spare/Growth
AH	79	Single	21	Green	Black	White	Identification Power
K	34	Single	22	Orange	Black	White	Weapon Ident Bit No. 0
q	33	Single	23	Blue	Black	White	Weapon Ident Bit No. 1
U	44	Single	24	Black	Red	Green	Weapon Ident Bit No. 2
a	56	Single	25	White	Red	Green	Weapon Ident Bit No. 3
d	68	Single	26	Red	Black	Green	Weapon Ident Bit No. 4
T	90	Single	27	Green	Black	Orange	Weapon Ident Bit No. 5
BC	102	Single	28	Orange	Black	Green	Simulator Present (AUR Simulator)
BV	108	Single	29	Blue	White	Orange	Capsule Arm Command (SIM)
BS	7	Single	30	Black	White	Orange	Capsule Dry
BK	116	Single	31	White	Red	Orange	Liquid Detector Power
NONE	128 to 82	Single		Red			Jumper wire inside the 128-pin connector - used to select CLS operation